

STRATIOMYIDAE OF COCOS ISLAND, COSTA RICA (DIPTERA)

NORMAN E. WOODLEY

Systematic Entomology Laboratory, PSI, ARS, USDA, % U.S. National Museum NHB
168, Washington, D.C. 20560.

Abstract.—Two species of stratiomyid flies are recorded from Cocos Island, an oceanic island in the tropical eastern Pacific Ocean. *Merosargus insularis* Curran, an endemic species described in 1934 is found to be common on the island, and *Cyphomyia whiteheadi* is described as new. Both species belong to large, widespread Neotropical genera.

Key Words: Diptera, Stratiomyidae, new species, Cocos Island, Pacific Ocean, distribution

Cocos Island is a small oceanic island lying in the far eastern Pacific Ocean. It is located at 5°32'57" North Latitude and 86°59'17" West Longitude, approximately midway between mainland Costa Rica and the Galápagos Islands. A more detailed description of the island and a summary of expeditions to the locality, including a preliminary list of terrestrial arthropods, were presented by Hogue and Miller (1981).

Recent entomological investigations into the Cocos Island fauna have been coordinated through the Natural History Museum of Los Angeles County (LACM). This institution forwarded their holdings of Stratiomyidae from the island, as well as those that they had accumulated from other museums (American Museum of Natural History, New York [AMNH], Museum of Comparative Zoology, Cambridge Massachusetts [MCZ], and California Academy of Sciences, San Francisco [CAS]), to me for study. Two species are present in the material, one previously described and the other undescribed.

Merosargus insularis Curran

Merosargus insularis Curran, 1934: 150.

Type material.—The holotype male is housed in the California Academy of Sci-

ences, and is labeled: "Cocos I. IX-3-05/ Coll. by F. X. Williams/Merosargus TYPE insularis ♂ Curran No." It was listed in the original publication of CAS No. 3795. The specimen is in excellent condition, with only the knob of the left halter missing and a minute bit of insect damage to the lateral areas of tergites two to four of the abdomen.

Diagnosis.—*Merosargus insularis* keys to *M. penai* James (known only from Ecuador) at couplet 48 in the key of James and McFadden (1971) by possessing the following features: Upper frons metallic green; prosternum brownish; scutum metallic green, only postalar calli, lateral areas of transverse suture, and narrow lateral margins postsuturally dirty brownish yellow; pleura with dorsal margin of katapisternum, posterior half of anepimeron, most of meron, and lateral areas of katatergite dirty yellowish; most of katapisternum ("pectus") dark brown with distinct metallic green reflections; legs with front tarsus and all femora yellow; wing with R₄ and M₁ fully developed; R₂₊₃ strong, arising at r-m, and ending in costa; and alula narrow and parallel-sided.

Merosargus insularis differs from *M. penai* in having the frontal callus whiter in

color, more strongly contrasting with lower frons; prothorax more extensively yellow, especially proepisternum; pale band on dorsal edge of katepisternum extending nearly to front coxa; meron mostly yellow; katepisternum extensively metallic green medially; front and middle legs with tarsi wholly yellow (although with some black pilosity); wing with alula with apical half and scattered areas anteriorly set with microtrichia; abdomen less petiolate in male; and sutural region between tergites four and five yellow.

Material examined.—COSTA RICA: COCOS ISLAND: 1 ♂, Wafer Bay, 11–16 April 1963, P. Slud (AMNH); 1 ♂, 2 ♀, Wafer Bay, 17–22 April 1975, C. L. Hogue (LACM); 19 ♂, 2 ♀ Wafer Bay Station 1, 23 March 1978, C. Hogue and S. Miller (LACM, USNM); 1 ♂, 3 ♀, Wafer Bay Station 3, 24 March 1978, Malaise trap, C. Hogue and S. Miller (LACM); 1 ♂, 1 ♀, same data but 25 March 1978 (LACM); 1 ♂, 1 ♀, same data but 26 March 1978 (LACM); 2 ♂, same data but 27 March 1978 (LACM); 1 ♀, Wafer Bay/Rio Genio, 15 March 1980, Malaise trap, T. K. Werner, T. W. Sherry (LACM); 1 ♀, same data but 21 September 1984 (LACM); 2 ♂, Rio Genio, 12 March 1980, Malaise trap, T. K. Werner, T. W. Sherry (LACM); 1 ♂, Chatham Bay, 8 March 1964, R. O. Schuster (CAS); 3 ♂, Chatham Bay, 9–11 April 1979, Malaise trap over stream, R. Silberglied (MCZ); 2 ♂, Chatham Bay, 8–11 April 1979, at hanging bananas, R. Silberglied (MCZ); 1 ♂, Mirador, 18 September 1984, Malaise trap (LACM); 1 ♂, summit of Cerro Iglesias, 3 March 1980, on vegetation, T. W. Sherry, T. K. Werner (LACM); 1 ♂, Cerro Iglesias, El. 1535 feet, 5 February 1984, at a *Roseveltia* tree fall, cut for palmeto, T. W. Sherry, T. K. Werner (LACM); 1 ♀, "interior," vegetation, 27 February 1980 (LACM); 1 ♂, same data but 28 February 1980, T. K. Werner, T. W. Sherry (LACM); 2 ♂, 3 ♀, no further data, 21 March 1984, Malaise trap, "HIBISCUS," T. W. Sherry, T. K. Werner (LACM).

Remarks.—*Merosargus insularis* was overlooked by James and McFadden (1971)

and James (1973). *Merosargus*, with 140 species presently considered valid, is one of the largest genera of Stratiomyidae. The genus is essentially neotropical, with only one species, *M. caeruleifrons* (Johnson) from the eastern United States, ranging entirely in the Nearctic Region. Unfortunately, the monograph of James and McFadden (1971) provided only a very superficial treatment of the male terminalia, which offer good diagnostic characters for species recognition. It is therefore difficult to identify some species based on color features used in their key and to be sure that specimens that key to a certain species are in fact conspecific with the authors' material. I have seen numerous undescribed species from Central and South America.

Merosargus insularis is similar in general appearance to *M. stamineus* (Fabricius) and *M. cingulatus* Schiner, as it is to *M. penai* James to which it keys in the key of James and McFadden. The first two are widespread species, common throughout their range from Mexico to South America. Unfortunately, due to the poor knowledge of the genus, it is not yet possible to comment on cladistic relationships of *M. insularis*.

As this species has been collected on several expeditions, and in fairly large numbers, it must be quite common on Cocos Island. Also, given that it has been collected from sea level to the highest point on the island, it probably occurs everywhere on the island.

Cyphomyia whiteheadi, NEW SPECIES

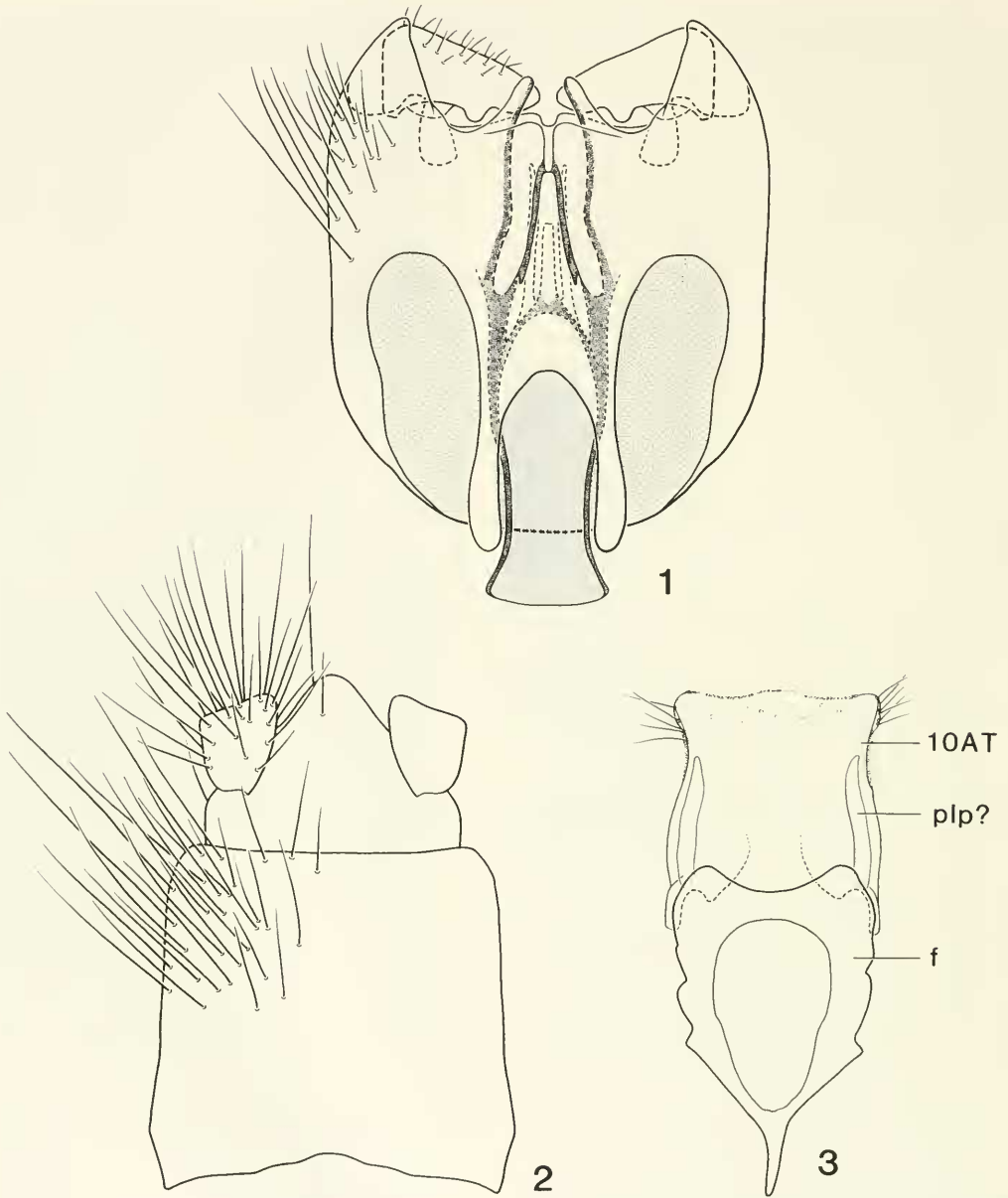
Type material.—The holotype male, housed at LACM, is labeled: "COSTA RICA Cocos Island summit of Cerro Iglesias 26.II.1980/under tree fern frond T. W. Sherry T. K. Werner/HOLOTYPE ♂ *Cyphomyia whiteheadi* N.E. Woodley 1991." Other than a little very minor wing damage, the specimen is in excellent condition. An allotype ♀ and 5 ♂ paratypes are designated; data are summarized in the material examined section below.

Diagnosis.—*Cyphomyia whiteheadi* be-

longs to a fairly large group of *Cyphomyia* species, including the type species of the genus *C. cyanea* (Fabricius), that have an overall blue-black color, dark wings, and females with a strongly contrasting yellow head. It belongs to a much smaller subgroup within this complex in which males also have the postocular orbits developed and have a yellow head. Males key to *C. androgyna* Osten Sacken from Costa Rica and Panama (couplet 29) in the key of James (1940); females key to couplet 44, but will not exit to *C. androgyna* because the scutellar spine are not erect. Instead they exist through the second half of the couplet where females of three South American species are not differentiated. *Cyphomyia whiteheadi* differs from *C. androgyna* in being less strongly metallic blue in color, having the postocular orbits much less strongly developed, no golden hairs at the anterior portion of the mesonotum, and the scutellar spines not erect but nearly in the same plane as the dorsal surface of the scutellum.

Description.—*Male*: Head whitish yellow except ocellar tubercle black, and occiput, postgena, and most of median occipital sclerite brownish black, lower frons above antenna vaguely darkened; eyes large, holoptic on upper frons, with extremely sparse and short hairs, appearing bare except at very high magnification; face slightly convex, evenly receding to oral margin; posterior ocular orbit narrow, width slightly less than length of second antennal segment; head largely devoid of tomentum, a little evident on lower frons, and along extremely narrow facial eye margins; head rather evenly pilose, longest on lower frons, face and posterior regions, mostly brownish black, but extensively whitish on lower half of face and along pale parts of posterior ocular orbit; antenna black, 1.63 times length of head (holotype), ratio of segments 15:8:[11:7:6:6:5:6:8:16], scape and pedicel densely set with black pilosity, flagellum velvety tomentose, a few short scattered hairs present on apical flagellomere; palpus black, moderately small, second segment elongate-

ovoid, basal segment with dark hairs, the second velvety tomentose; proboscis dark brownish. Thorax predominantly blackish with faint dark bluish metallic reflections, postpronotal lobe ochre yellow, posterior half of anepimeron and meron brownish; scutellum with spines approximately length of scutellum, nearly in same plane as its dorsal surface, with outer two-thirds yellow; thin, inconspicuous tomentum present on prosternum, lower anterior corner of anepisternum, most of meron, anatergite, mediotergite, and subscutellum except for lower, central portion; pilosity of thorax wholly dark, partly semiappressed on scutum, partly erect, erect elsewhere, absent on central portion of anepisternum, entire meron, anatergite, mediotergite, and lower portion of subscutellum; legs dark brownish black, sometimes femora slightly lighter than other segments, basitarsi and extreme bases of second tarsomeres of all legs whitish; legs evenly pilose, hairs dark except whitish yellow on light tarsal regions, although some dark hairs are present distally on basitarsi; wing evenly infusate with brown color, veins dark brown except stem vein yellowish, uniformly set with dense microtrichia except for basal three-fourths of cell posterior to stem vein, an anterior band extending most of the length of cell cup and along vein A_2 ; halter with stem brownish yellow, knob dingy white. Abdomen dark blackish with faint bluish reflections laterally, more violaceous on tergites four and five, anterior three tergites being primarily dull black, not shiny; sternites more uniformly colored, with faint bluish reflections, first sternite uniformly set with dark tomentum; second sternite slightly produced medially on posterior margin; abdomen uniformly set with dark pilosity, mostly short and semiappressed, some longer, more erect hairs present laterally on tergites, especially first two. Male terminalia (Figs. 1, 2) with gonocoxites slightly longer than wide, hypandrium completely fused, posterior portion of ventral bridge slightly produced, grooved medially, slightly bilobed; gonosty-



Figs. 1-3. Terminalia of *Cyphomyia whiteheadi*. 1, Male genital capsule, dorsal view. 2, Male epandrium and eleventh abdominal segment, dorsal view. 3, Female tenth abdominal segment, ventral view. Abbreviations: *f*, furca; *plp*, posterolateral process of furca; *10AT*, tenth abdominal tergite.

lus more or less triangular in dorsal view, tapered apically, interior face with subapical lobe; aedeagal complex complicatedly fused to gonocoxites, aedeagus trifold, laterally flanked by slender, lobe-like processes on

gonocoxites; epandrium (Fig. 2) simple, quadrate; eleventh tergite simple, cercus short, widened apically. Length 9.6 to 10.9 mm.

Female: Differs from male as follows:

Head with eye smaller, thus upper frons developed, narrow, nearly parallel-sided, 0.14 width of head, sparsely pilose with short black hairs; posterior ocular orbit slightly wider, pilosity completely dark; antenna similar to male, 1.75 times length of head. Thorax as in male, but scutum without longer erect hairs. Abdomen with dull black area present only on first two tergites; lateral hairs on abdomen shorter than in male. Female terminalia (Fig. 3) with median aperture of furca large, egg-shaped with posterior end larger; posteromedial margin of posterior bridge shallowly emarginate; posterolateral processes apparently very short and rounded, but possibly represented in part by elongate, narrow sclerite on each side that is not connected but closely approximate to posterior bridge; anterior margin strongly tapered anteriorly, ending in short, slender process; spermathecal ducts entirely membranous; cercus two-segmented, first segment slightly expanded apically, second subcylindrical, the two subequal in length. Length, 8.1 mm.

Material examined.—Holotype ♂ (see above for data). Allotype ♀, 2 ♂ paratypes, COSTA RICA, COCOS ISLAND: no further locality, 21 March 1980, Sherry-Werner (LACM, USNM). Additional paratypes: 1 ♂, summit of Cerro Iglesias, 21 March 1980, T. K. Werner, T. Sherry (LACM); 2 ♂, Cerro Iglesias, 21 March 1980, Malaise trap, T. K. Werner, T. W. Sherry (LACM, USNM).

Despite differences in labels, as all specimens except the holotype were collected on the same day, it seems likely that they are all from the Cerro Iglesias locality.

Remarks.—James (1973) lists 72 species of *Cyphomyia* that he considered valid from the Neotropical Region. A few of these reach the southern United States, but none are unique to the Nearctic. In various recent catalogs, 12 species are assigned to *Cyphomyia* from Old World localities. From material I have seen it appears that the Palearctic, Oriental, and Oceanian species are

correctly assigned. However, I very much doubt that *Cyphomyia pubiventris* Rondani from South Africa is properly placed. I have not seen any specimens that come close to *Cyphomyia* in the substantial amount of Afrotropical material I have examined, and have not been able to locate the type material, if it still exists. The genus has not been revised, and the summary by James (1940) is badly outdated, and was superficial to start with. Most of the types in European collections have not been critically examined.

As mentioned in the diagnosis, *C. whiteheadi* belongs in a large group of species in which the females have a dark, blue-black body, dark brown wings, and a contrastingly bright yellow head with strongly developed postocular orbits. Males of most of these species have similar body coloration except that the head is also dark, and the postocular orbits are not developed. A small subset of this species group, however, has males that also have a yellow head, usually with strongly developed postocular orbits. This apparently involves some sort of mimicry complex, as three separate genera of Pachygastrinae (*Hypselophrum* Kertész, *Platylobium* Lindner, and *Pseudocyphomyia* Kertész) have evolved a convergent color pattern and structural similarity to females of *Cyphomyia*. The head in these genera is very similar, being bright yellow with very strong postocular orbits. In *Pseudocyphomyia*, the anterior portion of the mesonotum has dense appressed golden pilosity also found in some species of *Cyphomyia*, such as *C. androgyna* Osten Sacken. Presumably, the selection pressures involved in this mimicry have led to development of female characteristics in males of a few species of *Cyphomyia*, although the parameters of the mimicry complex remain unknown. It is interesting to note that in *C. whiteheadi* the coloration of the head is not as bright as in most mainland species in this complex, and the postocular orbits are not nearly as strongly developed, hence the head

as conspicuous as in most members of the complex. In a purely speculative vein, it is possible that the Cocos Island species became isolated prior to full evolution of the mimicry complex, and in the absence of additional selection pressure failed to evolve the more conspicuous head.

The male genitalia of *C. whiteheadi* are very similar to those of *C. androgyna*, and also to those of *C. auriflamma* Wiedemann as illustrated by Iide (1963: 35). Differences are mainly in the shape of the gonostyli and the short, dorsal process of the gonocoxites dorsal to the gonostyli. Iide has separated the aedeagal complex from the gonocoxites in his illustrations. He shows the gonocoxal apodemes loosely connected in Fig. 33; the larger lobes shown dorsally in Fig. 34 I would consider to be processes of the gonocoxites.

The female ninth abdominal segment of *C. whiteheadi* (Fig. 3) has the tergite displaced posteriorly, and membranous medially. The ventral surface of this portion of the segment is entirely membranous, except for narrow lateral sclerites that may be part of the posterolateral processes of the posterior bridge of the furca. In ventral view, as Fig. 3 is drawn, they are actually quite difficult to see, as the sclerotized portions of the tergite conceal them. They are best detected in a ventrolateral view.

The name of this species is dedicated to the memory of Don Whitehead, who delighted in biogeography and problems in mimicry as they related to species recognition.

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